

(Theory)

WEED CLASSIFICATION

1. CLASSIFICATION BASED ON LEAF MORPHOLOGY

i. Broad Leaved Weeds

These are weeds with net-veined, simple or compound (trifoliate), oblong/ovate leaves, tap root system and stiff stem. Stem is well branched having primary, secondary and tertiary branches. Petiole commonly developed and often bearing stipules.

ii. Narrow Leaved/Grass Weeds

These are weeds with two-ranked, long, tapering, narrow, usually flat, opposite, sheathing leaves with ligules and parallel veins. Stem is round, hollow with nodes, internodes and fibrous root system.

iii. Sedges

These are similar to grass weeds but have three-ranked leaves-lacking ligules and auricles. Stem is triangular, most of these have modified rhizomes (root system.).

2. CLASSIFICATION BASED ON SEED TYPE

i. Monocotylednous Weeds

These weeds bear only one cotyledon. Monocotylednous weeds are divided into true grasses (Poaceae) and the grass like sedges (Cyperaceae) and rushes (Juncaceae).

ii. Dicotylednous Weeds

These weeds bear two cotyledons. Broad leaved weeds are included in this.

3. CLASSIFICATION BASED ON WEED LIFE CYCLE (ON-TOGENY)

Weed life cycles are important to understanding emergence sequences. Weed species with different life cycles also have different requirements for seedling establishment, growth, and reproduction. Understanding and recognizing the types of life cycle is also necessary for the effective and economic control of weeds, since the methods that control one type of weed may be useless or less effective against the others.

Weeds may be classified as annuals, biennials, perennials and ephemerals.

i. Annuals

An annual weed completes its life cycle in one year or in one growing season from germination to seed production and then dies. Such weeds are dependent upon seed alone for reproduction and are usually prolific seeders. Annuals are further classified as:

WINTER ANNUALS

These are weeds which germinate in the fall and live through winter, producing seed in spring or early summer of the following year i.e. from October-November to April-May. Examples are:

BROAD LEAF WINTER ANNUALS

Botanical name	English Name	Local Name	Active growth period
<i>Anagallis arvensis</i> L.	Blue pimpernel	Billi booti	November-April
<i>Brassica nigra</i> (L.) Kock.	Black mustard/ wild mustard		October-April
<i>Carthamus oxyacantha</i> Bieb.	Wild safflower	Pohli	November-May
<i>Chenopodium album</i> L.	Lambs quarters/ common goose foot	Bathu	October-May
<i>C. murale</i> L.	Nettle leaf goose/ fathen	Karund	September-May
<i>Cichorium intybus</i> L.	Blue daisy	Kasni	October-June
<i>Coronopus didymus</i> L. Smith	Swine cress	Jungli Haloon	October-April
<i>Euphorbia helioscopia</i> L.	Sunspurge	Chatri Dodhadk	October-April
<i>Fumaria indica</i> (L.) Hausskn.	Fumitory	Shahtra	November-April
<i>Galium aparine</i> L.	Cleavers	Hurhurya	November-April
<i>Lathyrus aphaca</i> L.	Meadow peavine	Jungli Mattar	November-April
<i>Malva neglecta</i> Wallr.	Dwarf mallow/ Country mallow	Sonchal	October- November, April- May
<i>Medicago denticulata</i> (L.) Wild.	Burclover	Maina	November-April

<i>Melilotus alba</i> Medik.	White sweet clover	Senji	December-May
<i>M. indica</i> (L.) All.	Indian clover	Senji	October-April
<i>Polygonum plebejum</i> L.	Prostrate knot weed/smart weed	Adranak	December, January- May, June
<i>Ranunculus muricatus</i> L.	Wild butter cup	Ghorsumbi	December-May
<i>Rumex dentatus</i> L.	Dock	Jungli Palak	October-May
<i>Silene conoidea</i> L.	Catchfly	Chota Tukla	November, December - April, May
<i>Silybum marianum</i> (L.) Gaertn.	Spiny milk thistle	Kandiali	November-May
<i>Sisymbrium irio</i> L.	Wild mustard	Khub Kalan	October-March
<i>Sonchus asper</i> (L.) Hill	Spiny sow thistle	Dodhak	November-April
<i>S. oleracious</i> L.	Sow thistle	Dodak	November-April
<i>Spergula arvensis</i> L.	Cornspurry	Kallri booti	November-April
<i>Stellaria media</i> L.	Chickweed	Chandni	November-April
<i>Trigonella polycerata</i> L.	Trefoil	Maini	November-May
<i>Vicia sativa</i> L.	Common vetch	Revari	October-April
NARROW LEAVED WINTER ANNUALS			
<i>Avena fatua</i> L.	Wild oats	Jungli Javi	October-April
<i>Lolium temulentum</i> L.	Rye grass	Dhanak	End October-April
<i>Phalaris minor</i> Retz.	Little seed canary grass	Dumbi sitti	End October-April
<i>Poa annua</i> L.	Meadow grass	Barik ghas	November-March.

SUMMER ANNUALS

These weeds germinate in spring to summer and produce seed in the autumn of the same year i.e. from March- April to September-October. Examples are:

BROAD LEAF SUMMER ANNUALS

Botanical Name	English Name	Local Name	Active growth period
<i>Amaranthus spinosus</i> L.	Spiny amaranth	Khardar chulai	Summer
<i>Cleome viscosa</i> L.	Spider flower	Hulhul	May-November
<i>Digera arvensis</i> Forsk.	Digera	Tandla	End May-October
<i>Mukia maderaspatana</i> (L.) Roem.	Wild cucurbit	Makro	Summer
<i>Portulaca oleracea</i> L.	Common purslane	Kulfa	March-October
<i>Sphenoclea zeylanica</i>	Goose weed	Mirch booti	June, July-August, September
<i>Trianthema portulacastrum</i> L.	Horse purslane	Itsit	May-October
<i>Tribulus terrestris</i> L.	Puncture vine	Bhakra	April-October
<i>Xanthium stumarium</i> L.	Common Cocklebur	Mahabat booti	Summer

NARROW LEAVED SUMMER ANNUALS

<i>Bracharia ramosa</i> (L.) Stapf.	Signal grass	Ghas	April-October
<i>Dactyloctenium aegyptium</i> L.	Egyptian grass	Madhana	April-November
<i>Digitaria sanguinalis</i> (L.) Scop.	Large crabgrass	Moti Khabbal	End March-August
<i>Echinochloa colona</i> (L.) Link.	Jungle rice	Swanki ghas	End April-October
<i>E. crusgalli</i> (L.) Beauv	Barnyard grass	Didhan	Early May-November
<i>Eleusine indica</i> (L.) Gaertn.	Goose grass	Madhani ghas	Summer
<i>Leptochloa panicea</i> (Retz.) Ohwi.	Red sprangletop		May, June-September, October

ANNUAL SUMMER SEDGES			
<i>Cyperus difformis</i> L.	Small flowered umbrella plant	Ghooiin	June-October
<i>C. iria</i> L.	Flat sedge	Ghooiin	June-October
<i>Fimbristylis dichotoma</i> (L.) Vahl.	Hoor grass	Choti bhooin	June-October
<i>Scirpus juncooides</i> Roxb.	Soft rush	-	July, August-September, October

ii. Biennials

A biennial weed completes its life cycle in two years. The first year it produces a rosette, stores food in roots, and over-winters. It flowers, sets seeds, and dies during the second year. Because they need undisturbed soil for two consecutive growing seasons, biennial weeds are most frequently found in fields that have been under- no tillage for several years. A cold period is needed for flower initiation and therefore biennials characteristically occur in temperate areas. Only a few weeds fall in this category e.g. Wild carrot (*Daucus carota*) . Depending on weather and soil fertility, biennials some time behave as annuals or short-lived perennials.

iii. Perennials

A perennial weed is one that lives for more than two years (growing seasons) and may live almost indefinitely. Usually, top growth dies each winter with below-ground structures persisting and initiating new growth in successive years. Although some of perennials grow fast enough to flower and produce seed in their first years, many take two or more years before their first flowers appear. Perennials can usually be distinguished from ephemerals, annuals and biennials by their thickened root systems or woody stems and by the frequent presence of underground stems or dormant buds at the base of the aerial stem. Examples of perennials are:

BROADLEAF PERENNIALS

Botanical Name	English Name	Local name	Active growth period
<i>Achyranthus aspera</i> L.	Prickly chaff flower	Puth kanda	May, June-October, November
<i>Amaranthus viridis</i> L.	Pigweed	Jungli Chulai	April-October
<i>Cirsium arvense</i> (L.) Scop	Creeping thistle	Laih	November-April

<i>Convolvulus arvensis</i> L.	Field bindweed	Lehli	October-April
<i>Cuscuta reflexa</i> Roxb.	Dodder	Akasbail	Throughout the year
<i>Eclipta prostrata</i> L.	Bitterweed	Chandni	March-November
<i>Euphorbia granulata</i> Forsk	Garden spurge	Hazardani	April-November
<i>E. hirta</i> L.	Red spurge	Lal dodhak	April-November
<i>Marsilia minuta</i> L.	Water fern	Chaupatti	April-November
<i>Sonchus arvensis</i> L.	Perennial sow thistle (Milk Thistle)	Daimi dodhak	Round the year
NARROW LEAVED PERENNIALS			
<i>Cynodon dactylon</i> (L.) Pers	Bermudagrass	Khabbal ghas	March-November
<i>Dichanthium annulatum</i> (Forsk.) Stapf.	Dicanthium	Palwan	Summer
<i>Paspalum distichum</i> L.	Water grass	Naru	May-October
<i>Setaria viridis</i> (L.) Beauv.	Green foxtail	Lomber ghas	May-October
<i>S. glauca</i> (L.) Beauv.	Yellow foxtail	Lomber ghas	May-October
<i>Sorghum halepense</i> (L.) Pers.	Johnson grass	Baru ghas	May-October
PERENNIAL SEDGES			
<i>Cyperus esculentus</i> L.	Yellow nutsedge	Deela	May-November
<i>C. rotundus</i> L.	Purple nutsedge	Deela	April-November
<i>Scirpus maritimus</i> L.	Sea club rush	-	Summer

PERENNIALS ARE CLASSIFIED AS:

A. SIMPLE PERENNIALS

These weeds usually produce a taproot without root buds or rhizomes and reproduce naturally only by seed but can reproduce from cut pieces e.g. *Sonchus arvensis*. (Milk thistle)

rhizome are also called

Creeping rootstock

Stolon: A horizontal plant stem that takes roots e.g. Strawberry

Bulb: Short stem with fleshy leaf e.g. Onion

Tubers: Enlarged structures in some used as storage organs e.g. potato

Rhizome: is a modified plant stem

B. CREEPING PERENNIALS

Stolons are stems that grow at the soil surface.

These may reproduce by aerial bulblets, bulbs, tubers, creeping roots, stolons, rhizomes and seed. The occurrence and intensity of perennial species generally increases as tillage is reduced. Examples are *Sorghum halepense*, *Agropyron repens*, *Cynodon dactylon*, *Convolvulus arvensis*, *Cyperus sp.* wild eye.

Creeping perennials are probably the most difficult to control. After the top of the plant is destroyed, regrowth will occur from the underground parts. Even after the mature plants are killed, seeds in the soil may reinfest the area. The young seedlings (6 to 8 weeks old) of perennials can be killed as easily as annuals by cultivation or appropriate chemicals, but one treatment is not likely to be sufficient for older plants. Vigilance will be necessary for many years to kill seedlings before they establish new patches of the perennial weeds. Many of these weeds may be dormant for years but still viable and capable of germination when conditions become favourable.

EPHEMERALS

Brassicaceae family weed

These are weeds with several very short life cycles each year, each of only a few weeks to a few months duration. Ephemerals include such weeds as shepherd's purse. They germinate, grow, flower, and shed seed as often as they can, whilst the climate and other conditions suit their growth and survival. Some are primarily summer growers, some grow best during the cooler months of winter, and other manage to survive and reproduce throughout the entire year. Ephemerals are chiefly weeds of gardens and of horticulture, their short life cycles enabling them to survive through to reproduction despite the frequent disturbance of the soil.

Ephemeral, annual and biennial plants can usually be distinguished from perennials by their thinner and weaker root systems and the absence of dormant buds either underground or at the base of the stem. The ephemeral, annual and biennial types of life cycle often overlap.

4. CLASSIFICATION BASED ON CO₂ ASSIMILATION

i. C₃ Weeds

Weeds which produce, as the first step in photosynthesis, 3-phosphoglyceric acid, which contains three carbon atoms (Calvin-Bensen cycle). Most weeds of temperate region are C₃ weeds. They exhibit photorespiration and are relatively inefficient photosynthetically compared to C₄ weeds. They generally have lower carbon dioxide fixation rates and higher compensation points than C₄ weeds. They require 18 molecules of ATP and 12 molecules of H₂O to synthesize a molecule of glucose. The rate of CO₂ release by photorespiration in

A respiration process in many higher plants by which they take up oxygen in the light and release CO₂, contrary to general pattern of photosynthesis. It is dependent on light. It occurs only in green tissues of C₃ plants. It is completely dependent on Calvin cycle (C₃ cycle). Some of the energy produced by PLS is wasted by this process. It occurs in the light intensity where the rate of photosynthesis is less than cellular respiration.

Dark respiration: 1. It is independent of light 2. It occurs in all living tissues of aerobic organisms 3. It is not coupled to C₃-cycle. 4. It occurs in cytoplasm & mitochondria only & involves glycolysis 5. O₂ is consumed & CO₂ is released

Silybum marianum (Kandiali)

C₃ weeds can be 3 to 5 times greater than that of released by dark respiration. Examples are:

Avena fatua, *Chenopodium album*, *C. murale*, *Cirsium arvense*, *Convolvulus arvensis*, *Cyperus difformis*, *Galium aparine*, *Ipomoea aquatica*, *Rumex dentatus*, *Xanthium strumarium*, *Phyla nodiflora*, *Polygonum plebejum*, *Sida acuta*, *Abutilon bidentatum* (Elmore and Paul, 1983).

ii. C₄ Weeds

Any weed that produces, as the first step in photosynthesis, oxaloacetic acid, which contains four carbon atoms (Hatch-Slack pathway). Most of C₄ weeds are tropical. They require 30 molecules of ATP and 24 molecules of H₂O to synthesize a molecule of glucose. C₄ weeds produce more glucose for a given leaf area than C₃ and consequently grow more quickly. They can also continue to photosynthesize at high light intensities and low CO₂ concentrations. C₄ weeds do not exhibit photorespiration, because synthesis of glycolic acid, the substrate for respiration, is much lower in C₄ weeds (about 10% of that of C₃ weeds). Most common C₄ weeds are:

Amaranthus viridis L., *Cynodon dactylon* (L.) Pers., *Cyperus esculentus* L., *C. iria* L., *C. rotundus* L., *Dactyloctenium aegyptium* (L.) Richter, *Digitaria sanguinalis* (L.) Scop., *Echinochloa colonum* (L.) Link., *E. crus-galli* (L.) Beauv., *Eleusine indica* (L.) Gaertn., *Euphorbia hirta* L., *Imperata cylindrica* (L.) Beauv., *Portulaca oleracea* L., *Setaria faberi* Herrm., *S. viridis* (L.) Beauv., *Sorghum halepense* (L.) Pers., *Trianthema portulacastrum* L. and *Tribulus terrestris* L. etc.

iii. CAM Weeds

Any of a group of succulent weeds that employ crassulacean acid metabolism for fixing atmospheric carbon dioxide. These include Cactus spp.

5. CLASSIFICATION BASED ON HABITAT (PLACE OF OCCURRENCE)

I. TERRESTRIAL WEEDS

Weeds growing in plains or upland areas. The terrestrial can be further divided into

a. woody

These weeds are very hardy in nature and have woody bark with quite hard stem. Trees and shrubs are included in the woody weeds and are perennials. Examples are: *Zizyphus rotundifolius*, *Acacia arabica*, *Lantana camara* and *Salsola baryosma* etc.

b. Herbaceous Weeds

These have green, non woody (succulent) aerial stems and are very common in occurrence. Examples are: *Avena fatua*, *Chenopodium album*, *Anagallis arvensis*, *Phalaris minor* and *Stellaria media* etc.

10. Mohabab broti
9. Jangli palak.
12. Adzanuk (wheat lentil)
11. Bukan broti (S. cane)

Goose grass
Kulfa
or
Lunak.

Moti chahal.
Green fox tail
(Lombard grass)

Phullen broti
ج. ج.

c. Weeds of Crop Plants

All winter and summer weeds.

d. Weeds of Lawns, Parks and Playgrounds

Imperata cylindrica, *Dichanthium annulatum*, *Cynodon dactylon*,
Medicago denticulata, *Euphorbia granulata*

e. Weeds of Gardens

Cynodon dactylon and *Stellaria media*

f. Weeds of Pasture Lands

Cynodon dactylon, *Cyperus rotundus*, *Digitaria sanguinalis*,
Dichanthium annulatum and *Medicago denticulata* etc.

g. Weeds of Water Channels

Paspalum distichum, *Cannabis sativa*, *Xanthium strumarium*,
Anagallis arvensis, *Stellaria media* and *Poa annua* etc.

h. Weeds of Waste Places

Chenopodium murale, *Rumex dentatus*, *Sisymbrium irio*,
Amaranthus viridis, *Malva neglecta*

II. WEEDS OF ROADSIDES

Cannabis sativa, *Saccharum benghalensis*, *S. spontanium*, *Amaranthus viridis*.

III. AQUATIC WEEDS

Weeds which grow in water. The aquatic weeds can be divided into:

a. Floating Weeds

A free floating or anchored aquatic weed adapted to grow with most of its vegetative tissue at or above the water surface and lowering or rising with the water level e.g. *Eichhornia crassipes* (Mart) Solms. (Water hyacinth).

b. Submerged Weeds

These aquatic weeds are normally attached to the bottom of a ditch and grow entirely beneath the surface of the water e.g. *Hydrilla verticillata* (L.) Presl. (Hydrilla).

c. Emerged Weed

A rooted or anchored aquatic weed adapted to grow with most of its leaf stem tissue above the water surface and not lowering or rising with the water level e.g. *Typha domingensis* Pers. (Cattail)

① Broomrape - Height up to 2 feet, yellow stem completely lacking chlorophyll. Flower - yellow, white or blue flowers. Seeds are

minute & brown in colour. When they are not flowering no part of the plant is visible on soil surface. As they have no chlorophyll they are totally dependent on the host. E.g. Tomato, Eggplant, potato, Cabbage, Sunflower, celery, bean.

6. CLASSIFICATION BASED ON HOST DEPENDENCE

i. Total Parasite

Weeds which totally depend on host and they can not prepare their own food due to lack of chlorophyll e.g. Orobanche spp. It occurs in tobacco, cotton, sunflower, sugarcane and sarson etc. Seeds of this species germinate only when roots of host plants exude certain biochemicals. Orobanche show chemotropic growth of the radicle towards the root of its host plant. Those which attack roots are termed as total root parasite (Orobanche spp.).

ii. Semi/Partial Parasite

Weeds which do not depend on host for entire life but they depend for part of their life cycle on the host e.g. Cuscuta spp. (stem parasite). Cuscuta have large seeds with large food reserves sufficient to allow the radicle to grow extensively while it is seeking a host plant. Also Striga (partial root parasite) attaches to the roots of host plant soon after germination, but does not emerge from the soil for several weeks. During this period it is totally dependent upon the host plant. Once they emerge, Striga plants produce chlorophyll and begin to generate their own assimilates, although water and mineral nutrients are drawn from the host plant. Striga also shows chemotropic growth of the radicle towards the root of its host plant.

Striga is a root parasite on sorghum, millets, maize, sugarcane, etc. Striga seeds do not germinate in the absence of host-secreted stimulant (e.g. strigol) or an artificial stimulant such as ethylene.

The major organ of parasitic weeds for attachment and penetration of the host tissue is known as the haustorium. The hyphae of the haustoria contact both xylem and phloem of the host plant for transport of water, minerals and assimilates from host plant to the parasitic plant. These haustoria are also believed to be involved in the transfer of hormones between host and parasite.

MISCELLANEOUS CLASSIFICATION

i. Noxious Weeds

Weeds arbitrarily defined by law as more troublesome and difficult to control. Examples are Cynodon dactylon, Cyperus rotundus, Imperata cylindrica, Orobanche spp., Striga sp.

ii. Objectionable Weeds

Those weeds whose seeds are difficult to separate when mixed with the crop seeds. For examples: Cichorium intybus in berseem; Avena fatua, Convolvulus arvensis, Galium aparine and Lathyrus aphaca in wheat, Echinochloa spp. in rice.

Striga - Genus (1)
Family: Orobanchaceae

Some species are serious pathogens of cereal crops - Bright green stems & leaves. Brightly coloured flowers. They are parasite of roots & require a living host for germination. Later on they can survive alone.

Complete Parasite.

① (Giant dodder) Cuscuta reflexa
It is from morning glory family. Also called Devils hair.
Family: Convolvulaceae.

It is leafless. Thin vine produces branches which can cover the plant. Flower small & white in colour.

Loranthus (partial stem parasite of mango) take food from plant vascular system.

witch weed

Cyperus grass